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DIASTYLOPSIS GOEKEI, A NEW SPECIES (CRUSTACEA: CUMACEA: DIASTYLIDAE) FROM ANTARCTIC WATERS

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Abstract.—Specimens of *Diastylopsis goekei,* n. sp. were collected at depths ranging from 2 to 399 m in the Weddell Sea, the Ross Sea, and along the Antarctic Peninsula. *Diastylopsis goekei* is most closely related to two other Subantarctic-Antarctic species, *Diastylopsis annulata* (Zimmer, 1902) and *D. dentifrons* (Zimmer, 1903). *Diastylopsis goekei* can be distinguished from these and all other members of the genus by the following combination of characters: (1) carapace with 8–9 transverse ridges, (2) ocular lobe with 2 teeth, (3) first and second ridges with a row of mid-dorsal teeth (absent in adult male), (4) second ridge with a tooth on each side of frontal lobe, (5) pseudorostral lobes with an arch of teeth, appearing as a conspicuous lateral serration when viewed dorsally, and (6) telson longer than the peduncle of the uropod. The taxonomic status of several species of the genus *Diastylopsis* is briefly discussed.

The genus *Diastylopsis* contains nine species (Jones 1969), all recorded from latitudes greater than 30°, both in the northern and southern hemispheres (eastern and western North Pacific, Magellan Strait, New Zealand, Subantarctic Islands, and Antarctica). This paper deals with the description of a new species collected on the continental shelf and slope of eastern Antarctica.

Many specimens used in this study were obtained during the Antarctic cruises of the research vessels *Eltanin, Glacier,* and *Hero* between 1962–1982 and made available through the Smithsonian Oceanographic Sorting Center. Additional specimens were taken during the Argentine Antarctic Survey of 1990.

The types and other specimens utilized in the present study have been deposited in the Museo Argentino de Ciencias Naturales "Bernardino Rivadavia," Buenos Aires (MACN) and the National Museum of Natural History, Smithsonian Institution (USNM).

In this paper the term "adult female" refers to a female with fully developed oöstegites, "preparatory female" to a female with incipient oöstegites long enough to meet at the mid-ventral line, "adult male" to a male with fully formed pleopods, "preparatory male" to a male with developing pleopods, "juvenile" to a female or male in an early stage of development, and "manca" to a specimen lacking the last pair of peraeopods.

Diastylopsis goekei, new species
Figs. 1–4

Type material.—Holotype, adult ♀ (MACN 33440). Type locality: "Caleta Potter," "Isla 25 de Mayo" (King George Island), Antarctic Peninsula, 2 m, Aug 1990, Light trap. Paratypes from the same locality: 1 adult ♀, 3 juveniles (MACN 33441); 1 adult ♀, 1 adult ♂, 3 juveniles (USNM 251917).

Additional material examined.—Antarctic Peninsula: *Eltanin* Cr. 6, St. 408 (61°16′S, 56°11′W, 223–225 m, 31 Dec 1962, Menzies trawl): 1 adult ♀, 5 juveniles. *Eltanin* Cr. 6, St. 410 (61°18′–61°20′S, 56°09′–

56°10′W, 220–240 m, 31 Dec 1962, Blake trawl): 1 adult ♀. *Eltanin* Cr. 6, St. 437 (62°50′–62°51′S, 60°35′–60°40′W, 267–311 m, 9 Jan 1963, Blake trawl): 1 juvenile. *Eltanin* Cr. 6, St. 439 (63°50′–63°51′S, 62°35′–62°38′W, 128–165 m, 9 Jan 1963, Blake trawl): 1 juvenile. *Eltanin* Cr. 12, St. 1003 (62°41′S, 54°43′W, 210–220 m, 15 Mar 1964, Blake trawl): 2 juveniles. *Hero* Cr. 691, St. 23 (64°11.3′–64°12.1′S, 62°39.6′–62°40′W, 93–95 m, 9 Feb 1969, Try net): 1 preparatory ♀. *Hero* Cr. 824, St. 3 (65°14′S, 64°15.5′W, 56–60 m, 15 Mar 1982, Van Veen grab): 1 preparatory ♀, 2 juveniles. *Hero* Cr. 824, St. 28 (64°13.8′–64°14.2′S, 62°34.1′–62°35.1′W, 70–98 m, 24 Mar 1982, Blake trawl): 1 juvenile. A sample taken by the "Instituto Antártico Argentino" at "Caleta Potter," "Isla 25 de Mayo" (King George Island), 2 m, Aug 1990, Light trap: 6 adult ♀♀, 1 preparatory ♀, 22 juveniles. Ross Sea: *Eltanin* Cr. 51, St. 5761 (76°01.5′–76°01.6′S, 179°49.9′–179°53.5′E, 388–399 m, 8 Feb 1972, Menzies trawl): 2 adult ♀♀, 1 preparatory ♀, 2 preparatory ♂♂, 10 juveniles, 2 mancas. *Eltanin* Cr. 51, St. 5762 (76°02.1′–76°02.3′S, 179°52.1′–179°57′W, 347–358 m, 9 Feb 1972, Menzies trawl): 1 preparatory ♀, 7 juveniles, 1 manca. Weddell Sea: *Glacier* Cr. 2, St. 0009 (77°54.2′S, 45°13.3′W, 252 m, 3 Mar 1969, Anchor dredge): 1 juvenile.

Diagnosis.—Carapace with 8–9 transverse ridges, first and second ridges with row of mid-dorsal teeth (absent in adult male), second ridge with 1 tooth on each side of frontal lobe; ocular lobe with 2 teeth; pseudorostral lobes with arch of teeth, appearing as conspicuous lateral serration when viewed dorsally. Telson of adult female slightly longer than peduncle of uropod, with 9–12 spines on each side. Telson of adult male distinctly longer than peduncle of uropod, with 20–21 spines on each side. Uropodal endopod of adult female with 7–9, 3–4, and 2 spines on inner margin of articles 1–3, respectively. Uropodal endopod of adult male with 20–21, 10 and 6 spines on inner margin of articles 1–3, respectively.

Description.—Adult female: Length: 7.6–8.9 mm (from tip of pseudorostrum to end of telson). Integument thin and translucent. Carapace (Fig. 1A, B) slightly more than one fourth total length, width 0.7–0.8 times of length, and slightly greater than or equal to depth; with 8–9 transverse ridges (see also Fig. 4): first weakly developed, reduced to row of mid-dorsal teeth behind ocular lobe and ill-defined line on pseudorostral lobes; second complete, with row of mid-dorsal teeth and 1 tooth on each side near frontal suture; third complete, laying just behind frontal lobe, sometimes with several incipient mid-dorsal teeth; fourth not reaching dorsal mid-line of carapace; fifth complete; sixth–eighth interrupted dorsally, eighth frequently weak and broken, or absent; ninth complete, running parallel to posterior and postero-lateral margins of carapace. Ocular lobe lacking eyes, about 0.5 times as long as pseudorostrum, armed with 2 teeth. Pseudorostral lobes with arch of teeth, appearing as conspicuous lateral serration when viewed dorsally. Antennal notch rounded; antero-lateral angle with acute tooth; antero-ventral margin of carapace armed with row of teeth decreasing in size posteriorly.

Thorax typical of genus, varying between 0.8–1.0 times of carapace length depending on degree of overlap in segments.

Abdomen less than 0.5 times combined lengths of carapace and thorax; first segment without sternal tooth; fifth distinctly longer than others.

Telson (Fig. 3A) slightly more than 1.5 times length of sixth abdominal segment; armed with 9–12 spines laterally and 2 stout spines terminally, terminal spines slightly longer than posterior lateral spines.

First antenna (Fig. 1C). Peduncle, first article slightly longer than second and third combined; second article slightly longer than

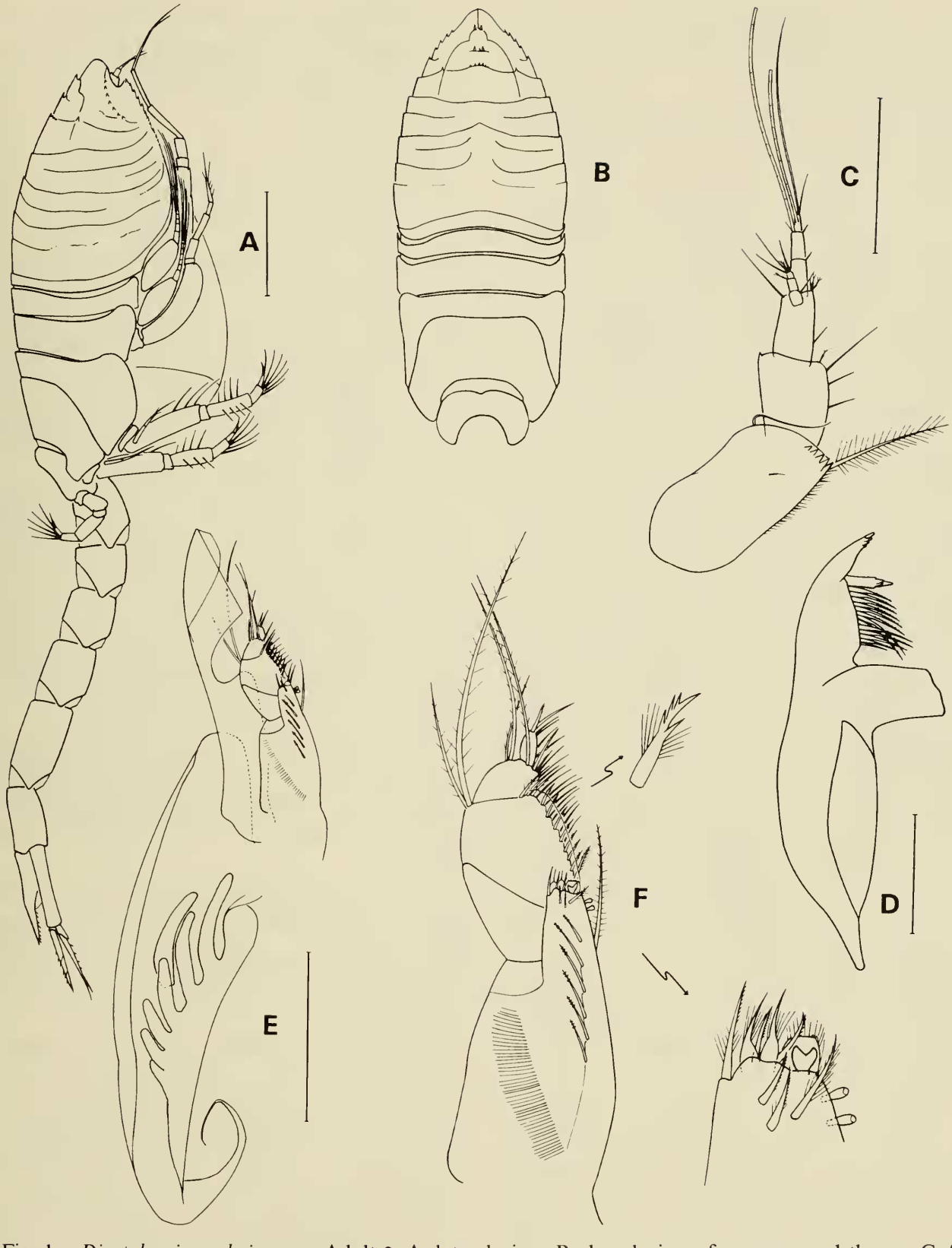

Fig. 1. *Diastylopsis goekei,* n. sp. Adult ♀: A, lateral view. B, dorsal view of carapace and thorax. C, first antenna (right). D, mandible (left). E, first maxilliped (left). F, details of first maxilliped endite. Scales = 1 mm for A–B (same scale); 0.2 mm for C–D; 0.5 mm for E.

third. Both flagella 3-articulate; accessory flagellum almost as long as proximal article of main flagellum.

Mandible (Fig. 1D) with 13–14 serrate spines between the incisor and molar processes.

First maxilliped (Fig. 1E, F). Basal process as illustrated, characterized distally by 2 broad-based setae, 1 short, thick lobe (all three furnished with setules), and 1 bifid, refringent body. Carpus, inner margin with numerous setae and row of characteristic spines (see spine enlarged in illustration).

Second maxilliped (Fig. 2A). Basis robust, about one third longer than combined lengths of other articles; inner distal margin with 5–6 stout plumose setae, outer distal margin with 4–5 less well-developed, slightly bipectinate setae. Ischium unarmed, distinct from dorsal view, but almost imperceptible ventrally. Carpus longer than combined lengths of propodus and dactylus, with approximately 8 plumose setae on inner margin and 2 on outer distal margin. Oöstegite bearing 12–15 setae.

Third maxilliped (Fig. 2B). Basis more than twice as long as combined lengths of other articles, inner margin with plumose setae and distal row of denticles; external distal process weakly developed, bearing 4–5 plumose setae. Ischium and merus with plumose setae and serrations distally. Carpus with plumose setae, inner margin with 4 denticles increasing in size distally. Propodus and dactylus with simple or weakly plumose setae, denticles absent.

First peraeopod (Fig. 2C) extending beyond the tip of pseudorostrum by length of dactylus. Basis about 0.8–0.9 times as long as combined lengths of other articles; both margins with plumose setae; distally with 1 short simple seta on ventral face and long plumose setae on dorsal face; denticles occurring on ventral face, both distally and on row parallel to outer margin. Ischium and merus, combined lengths equal to propodus, both articles with denticles distally and 1 small simple seta on inner margin. Carpus, propodus, and dactylus elongate, bearing simple setae; carpus about 0.2 times longer than propodus and 0.1 times longer than dactylus.

Second peraeopod (Fig. 2D). Basis about 0.9 times of combined lengths of other articles, inner margin with numerous plumose setae and 1 distal spine, outer margin with 1 distal plumose seta. Merus with 1 distal spine and 1 plumose seta on inner and outer margins, respectively. Carpus about 0.9 times of combined lengths of ischium and merus, with 4–5 distal spines. Propodus and dactylus with simple setae, combined lengths about 0.2 times longer than carpus.

Third peraeopod (Fig. 2E). Basis, length approximately equal to combined lengths of ischium, merus, and carpus; with numerous plumose and simple setae. Remaining articles with simple setae only. Carpus about 0.4 times as long as merus. Propodus slightly shorter than dactylus. Exopod rudimentary, composed of 2 articles.

Fourth peraeopod similar to third except basis approximately same length as ischium and merus combined, carpus about 0.5 times as long as merus, some differences in setation.

Fifth peraeopod (Fig. 2F) similar to third except basis approximately the same length as merus, carpus approximately two thirds as long as merus, exopod lacking, some differences in setation.

Uropod (Fig. 3A). Peduncle, slightly shorter than telson, inner margin with 10–12 spines. Rami subequal, about 0.70–0.75 times as long as peduncle. Endopod, articles decreasing in length distally; first article slightly longer than other two combined, with 7–9 spines on inner margin and 1 seta on outer margin; second with 3–4 spines on inner margin and 2 setae on outer margin; third with 2 spines on inner margin, 2 setae on outer margin, and 1 spine (slightly shorter than article) distally. Exopod, first article with 1 small seta on outer margin, second

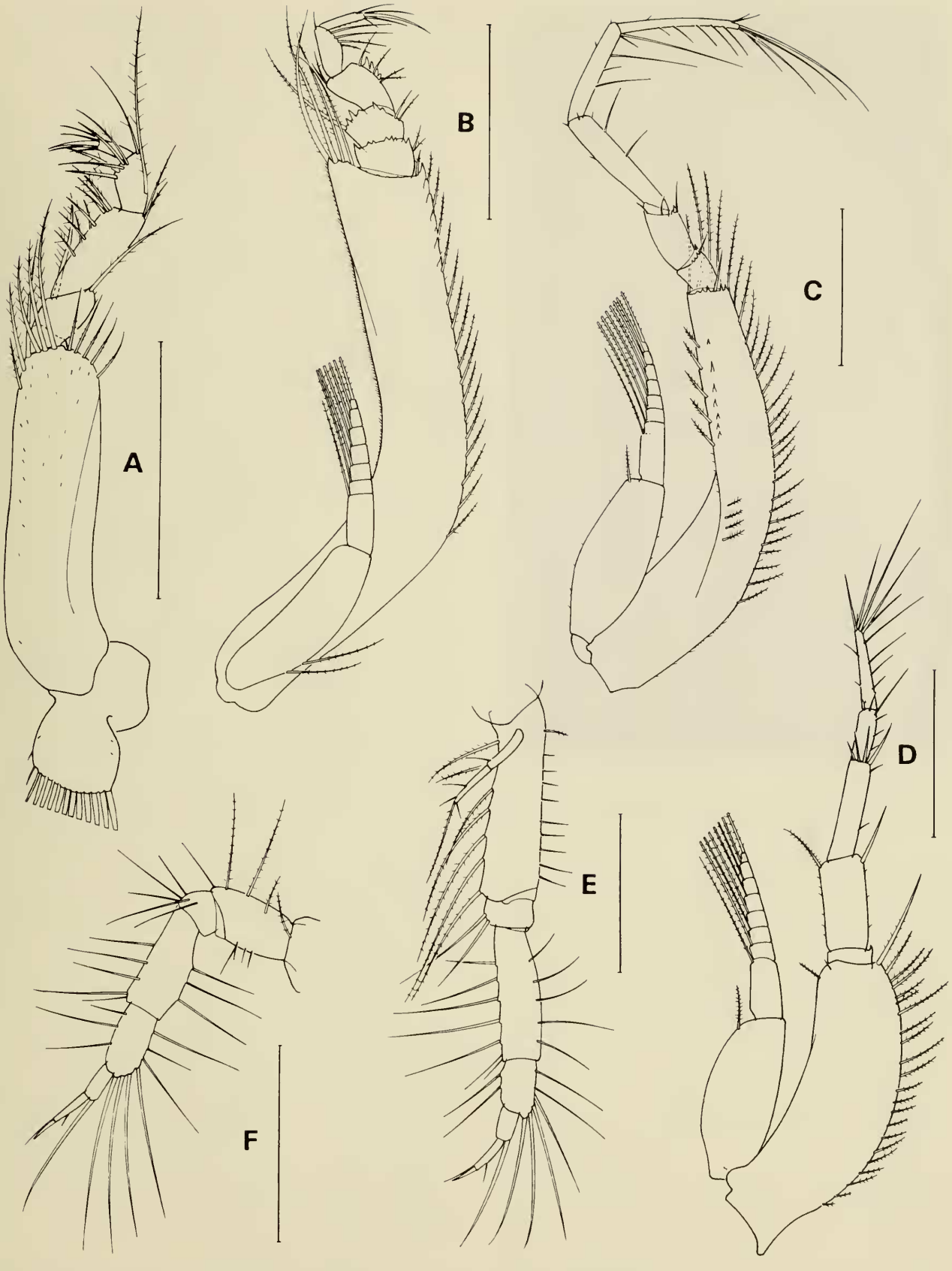

Fig. 2. *Diastylopsis goekei*, n. sp. Adult ♀: A, second maxilliped (left). B, third maxilliped (right). C, first peraeopod (right). D, second peraeopod (left). E, third peraeopod (left). F, fifth peraeopod (left). Scales = 0.5 mm.

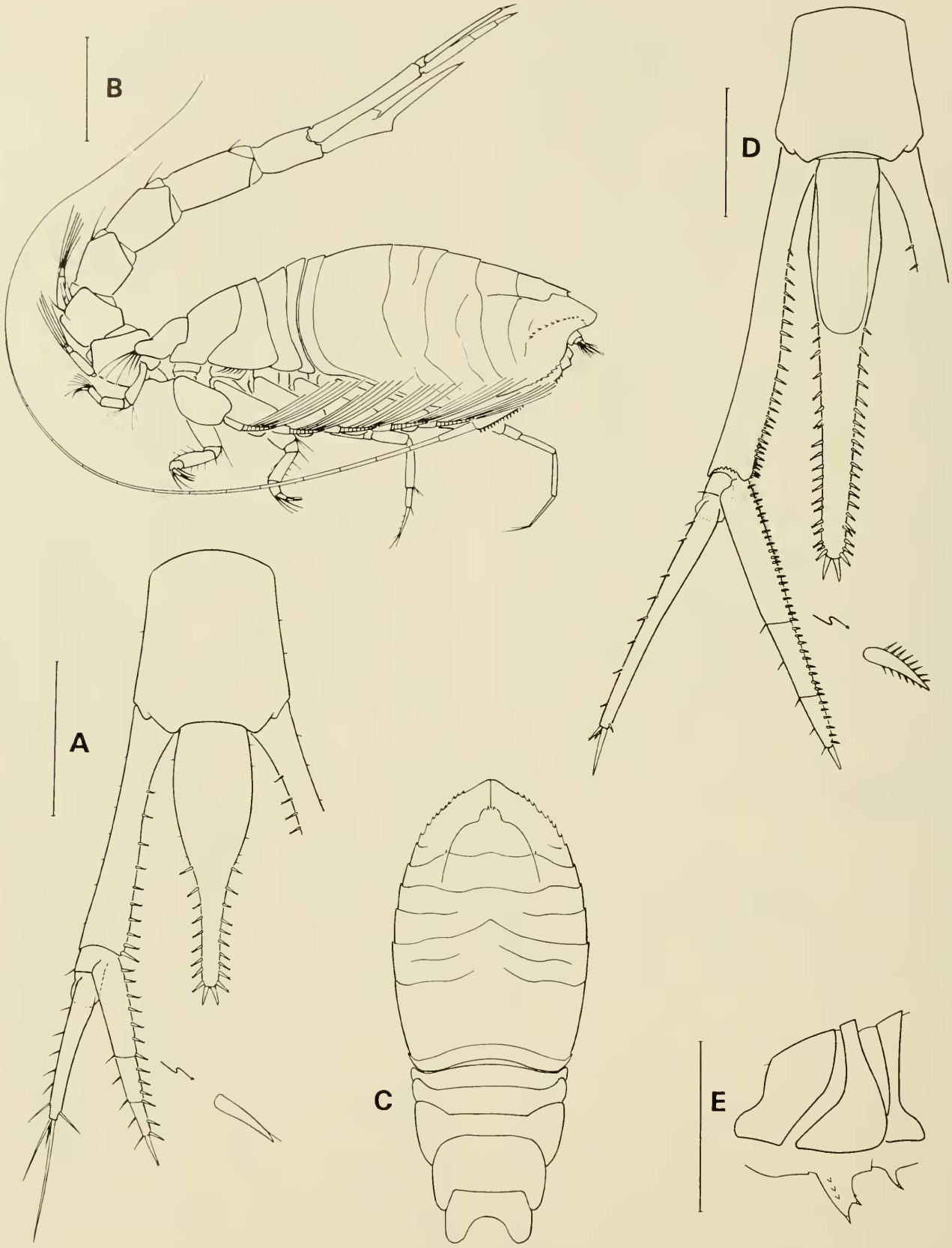

Fig. 3. *Diastylopsis goekei,* n. sp. Adult ♀: A, telson and uropod (left). Adult ♂: B, lateral view. C, dorsal view of carapace and thorax. D, telson and uropod (left). Juvenile: E, thoracic segments 2–4 (peraeopods omitted). Scales = 0.5 mm for A, D–E; 1 mm for B–C (same scale).

article with numerous setae, viz., 10–13 irregularly alternating on dorsal and ventral outer margins (only dorsal ones drawn), 1 subterminal on inner margin, and 3 unequal terminal (longest seta somewhat shorter than second article).

Adult male.—Length: 9.3 mm (from tip of pseudorostrum to end of telson).

In addition to sexual differences in the development of the antenna, exopods, and pleopods, the adult male differs from the adult female by the following characters:

Carapace (Fig. 3B, C) approximately 0.3 times total length; anterior part wider in dorsal view. First and second ridges without row of mid-dorsal teeth; eighth ridge absent. Antennal notch less pronounced; anterolateral angle rounded.

Thorax approximately two thirds as long as carapace.

Telson (Fig. 3D) approximately 2.5 times as long as sixth abdominal segment, approximately as long as fifth and sixth segments combined; armed with 20–21 spines on each side and 2 stout spines terminally, terminal spines clearly longer than posterior lateral spines; pre-anal region with mid-dorsal depression bounded by sharp carina.

Uropod (Fig. 3D). Peduncle, approximately 0.8 times as long as telson, inner margin with 24–26 pectinate spines. Rami 0.80–0.85 times as long as peduncle. Endopod, inner margin of articles 1–3 with 20–21, 10 and 6 pectinate spines, respectively; distal end, spine about 0.5 times as long as the third article. Exopod: second article, outer margin with setae becoming spines distally (14–15 in total; only dorsal ones drawn), inner margin with 1 subterminal spine, distal end with 3 unequal spines (longest spine approximately 0.2 times as long as second article). All exopod spines nonpectinate. Other appendages were not examined to avoid destroying the only adult male available.

Juvenile and preparatory instars.—(Fig. 3E). Second thoracic sternite of males with spiniform projection (rudimentary in adult males, absent in all female stages). Third thoracic sternite in both sexes with prominent mid-ventral projection armed with 1–3 medial and 0–3 lateral spines; projection more developed in males than in females (rudimentary in adult males, absent in adult females).

Fig. 4. *Diastylopsis goekei*, n. sp. Juvenile: Scanning electron micrograph of carapace. Scale = 0.5 mm.

Variation.—Slight deviations in the general pattern of the ridges of the carapace were observed.

Etymology.—The species is named in honor of Gary D. Goeke for his help in the initial stages of our study and in recognition of his contributions to carcinology.

Remarks.—*Diastylopsis goekei, D. annulata* (Zimmer, 1902), and *D. dentifrons* (Zimmer, 1903) are distinguished from all other members of the genus by having 8–9 transverse ridges on the carapace and the

telson equal to or longer than the peduncle of the uropod. *Diastylopsis annulata* and *D. dentifrons* have an anterior mid-dorsal carina bearing three large, forwardly directed teeth on the frontal lobe. This feature was confirmed by the examination of a juvenile from South Georgia Island (USNM 251933) and some of the females and juveniles from Kerguelen Islands reported by Ledoyer (1977). *Diastylopsis goekei* is easily distinguished from *D. annulata* and *D. dentifrons* by having (1) carapace without a mid-dorsal carina, (2) two transverse rows of teeth on frontal lobe (absent in adult male), and (3) an arch of teeth on pseudorostral lobes, appearing as a conspicuous lateral serration when viewed dorsally. To clearly establish differences in the chaetotaxy and proportions of the articles of the appendages, more complete descriptions based on adult specimens from the type localities of *D. annulata* and *D. dentifrons* are necessary.

Diastylis anderssoni Zimmer, 1907 (type locality South Georgia Island) resembles *Diastylopsis goekei, D. annulata,* and *D. dentifrons* by the presence of numerous transverse ridges on the carapace and a rudimentary exopod on the third and fourth peraeopods of the female. *Diastylopsis goekei* can be distinguished from *Diastylis anderssoni* by possessing the third and fourth thoracic segments more produced posteriorly, a smaller size, and a telson which extends beyond the uropodal peduncle (in *D. anderssoni* the telson is distinctly shorter than the uropodal peduncle).

Discussion.—Jones (1969) listed the following species of *Diastylopsis* Smith, 1880: *D. dawsoni* Smith, 1880 (North Pacific); D. *tenuis* Zimmer, 1936 (Southern California); *D. elongata* Calman, 1911, *D. crassior* Calman, 1911, and *D. thileniusi* (Zimmer, 1902) (New Zealand); *D. robusta* (Zimmer, 1902) (Magellan Strait); *D. annulata* (Zimmer, 1902), *D. dentifrons* (Zimmer, 1903), and *D. diaphanes* Zimmer, 1907 (Subantarctic and/or Antarctic waters). More recently, Băcescu (1982), based on a typographic error, introduced the name *Diastylopsis bosphorica* in his description of a new species belonging to *Diastyloides* Sars, 1900.

There are several unresolved taxonomic problems involving some of the species of *Diastylopsis*. Zimmer (1907, 1913) presented a brief description of *D. diaphanes* based on a manca collected off western Antarctica and its taxonomic position remains questionable.

The description of *D. annulata* was based on two juvenile females from South Georgia Island (Zimmer 1902, 1909), and that of *D. dentifrons* on two females (both with fully developed oöstegites?) and two juvenile males, all from the Kerguelen Islands (Zimmer 1903, 1908, 1913). Later, Hale (1937) examined a large series of *Diastylopsis* from Heard Island and described the adult female and the juvenile male stages. Based on his observations, he regarded the specimens of this series as intermediate between *D. annulata* and *D. dentifrons* and considered the latter as a junior synonym of the former. This designation has been followed by Lomakina (1968), Jones (1971), and Ledoyer (1974, 1977). However, we believe that until adult specimens of *D. annulata* from South Georgia are available, this synonymy cannot be confirmed.

Derjavin (1926) described *Diastylopsis calmani* from the western North Pacific, but Lomakina (1958) considered this species as a "forma" of the type species, *D. dawsoni* Smith, 1880, which was originally described from the eastern North Pacific. Lomakina's opinion was also followed by Gamô (1965, 1968). We believe that a careful comparison of eastern and western North Pacific specimens is required to justify this nomenclatural change.

Day (1980) transferred *Diastylopsis thileniusi* to the genus *Dic* Stebbing, 1910. This species is in an intermediate position between both genera. *Dic thileniusi* has, like the other three members of the genus *Dic,* a third maxilliped with a greatly expanded ischium. However, it differs from these three

species by having the third and fourth thoracic segments markedly produced posteriorly, which is characteristic of the genus *Diastylopsis*.

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